Jetstream-31 (J31) Flight Report for INTEX-ITCT
Flight 7
12 July 2004
Aqua underflight with profiles, Ron Brown rendezvous

Overview

12 July was the first day of the J31's 4-week period for science flights out of Pease. Flight 7 had 3 goals:

1. Develop experience in
- Coordination with a satellite overpass, the Ron Brown, and air traffic control
- Flying low over water with the new J31 radar altimeter
2. Measure aerosol effects on radiation
- Direct solar beam attenuation (expressed as aerosol optical depth, AOD), measured by AATS-14
- Radiative flux spectra, measured by SSFR
3. Compare J31 measurements to others
- Near-surface spectra of albedo and AOD to MODIS on Aqua
- AOD to sunphotometers on Ron Brown
- Extinction profile to lidar on Ron Brown
- Radiative fluxes to Ron Brown
- Meteorological measurement profile to sonde to be released by Ron Brown

J31 and the instruments performed very well. We accomplished most objectives. Clouds over the Ron Brown prevented AOD and extinction profile measurements there, so we conserved flight hours by not flying a profile there for comparisons to a Ron Brown sonde.

Clouds, satellites, and Flight Planning

Cloud predictions at the 8:30 weather briefing gave a very uncertain picture of conditions during the Terra and Aqua overpass times (1442, 1621, and 1813 UT, or 1042, 1221, and 1413 EDT). Portsmouth and the Gulf of Maine were cloud covered in the morning, with the possibility of a clearing moving over the Gulf of Maine in the afternoon. Throughout the morning we made full use of the cloud prediction models, satellite images, and J31 flexibility to develop a flight plan with a nominal 1330 EDT takeoff, go/no-go decision by 1200 EDT, and flexibility to abort as late as 1300 EDT. The 1330 EDT takeoff was chosen to give the best chance of cloud clearing while still permitting J31 arrival at an Aqua validation point over the Gulf of Maine by the 1413 EDT overpass time.

Just before 1300 EDT we made the final decision not to abort, based on IR and visible imagery that arrived at ~1245 EDT. The images showed a clear area over the Gulf of Maine that included a glint-free area for MODIS on Aqua, with an edge near the Ron Brown.

Aqua MODIS Sunglint Predictions

John Livingston and Jens Redemann used Jens's glint calculation program to select the western Gulf of Maine as glint-free for the MODIS-Aqua overpass at 1413 EDT. Eastern Gulf of Maine was in glint.

Flight Path, Timing, and Measurements

Flight path is shown below. We took off ~1805 UT (1305 EDT). Takeoff was delayed slightly, first by the

need for a preflight telecon with Boston air traffic control, then by incoming air traffic at Pease. We were at near-minimum altitude in a cloud-free, glint-free area of the Gulf of Maine (~43.05 N, 69.4 W) at ~1820 UT, within 7 minutes of Aqua overpass. We flew a survey spiral ascent to ~4.5 km. AATS AOD profiles, shown below, revealed several aerosol layers. We flew a level leg at profile top to get radiative flux spectra. During that leg we used the Livingston profile display tool to select heights for radiation legs. Based on the AOD profile and allowed flight levels we flew the radiation legs at 3.6, 2.95, and 0.75 km (in addition to 4.5 and 0.06 km).

After completing the ascent and stepped descent profiles in the cloud-free area we headed for the Ron Brown. It was under cloud at ~42.8 N, 70.7 W. Communication was initially hampered because we had dropped a digit in the radio frequency (we were using 2295 instead of 22925). We actually got the corrected frequency by cell phone call to Tim Bates on the Brown! Thereafter, both aircraft and marine band (Ch 82) communication between J31 and Ron Brown worked well. We flew 2 passes by the Ron Brown's starboard side (away from the lidar on the port side). This provided SSFR fluxes for comparison to Ron Brown fluxes. The cloud cover prevented AOD and extinction profile comparisons. J31 headed for Pease at low altitude. We landed at ~2028 UT (1628 EDT).

Instrument Performance

Position and Orientation System (POS): Accuracy from 4 to <1 m horizontal, <1 m vertical. Use of auxiliary GPS needs some adjustment

Nav/Met: Data displayed by AATS looked good. No data dropouts. Accuracy needs to be checked via comparisons to sondes and other A/C.

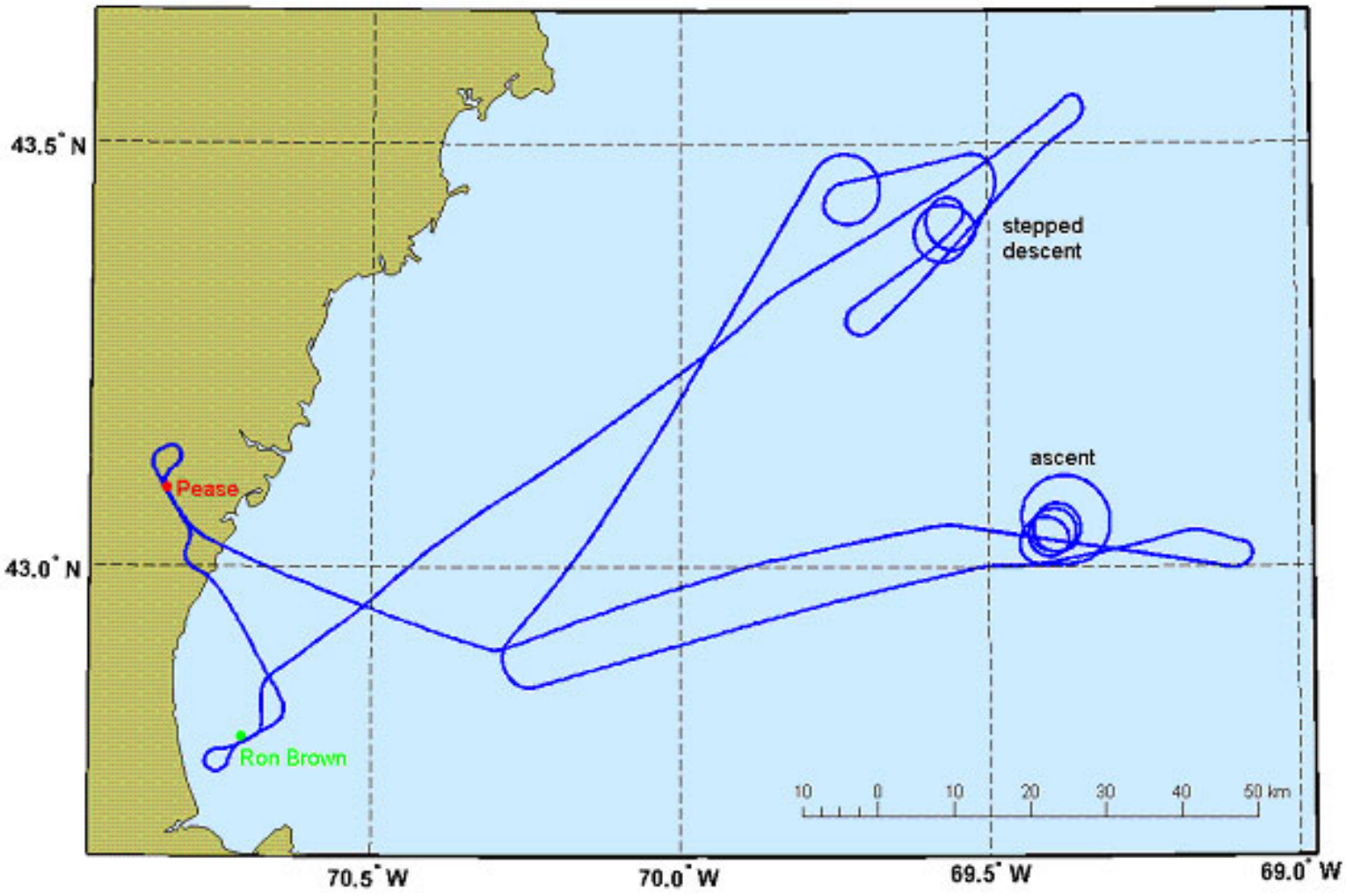
SSFR: Operations OK. Zenith cal appeared off. (Recalibration data were taken the next day, and the cause of the calibration change was fixed.)

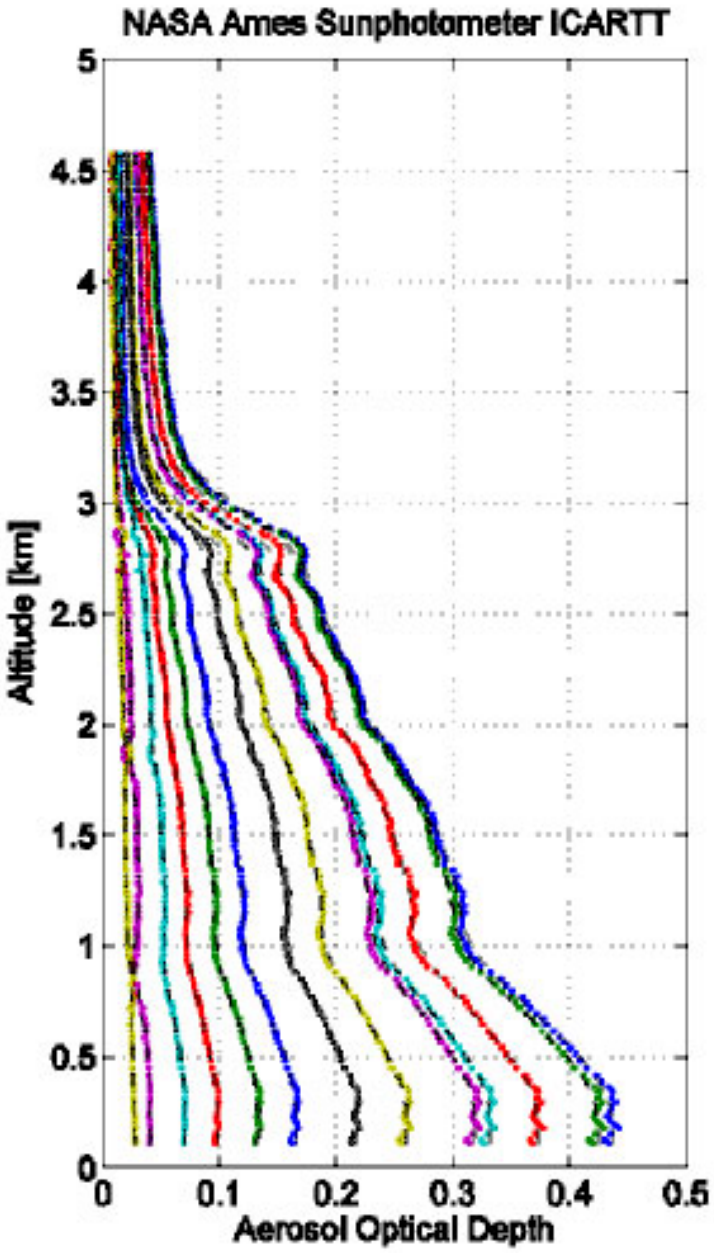
AATS: No problems with operations. Profile display tool worked well-used inflight to select levels for SSFR legs.

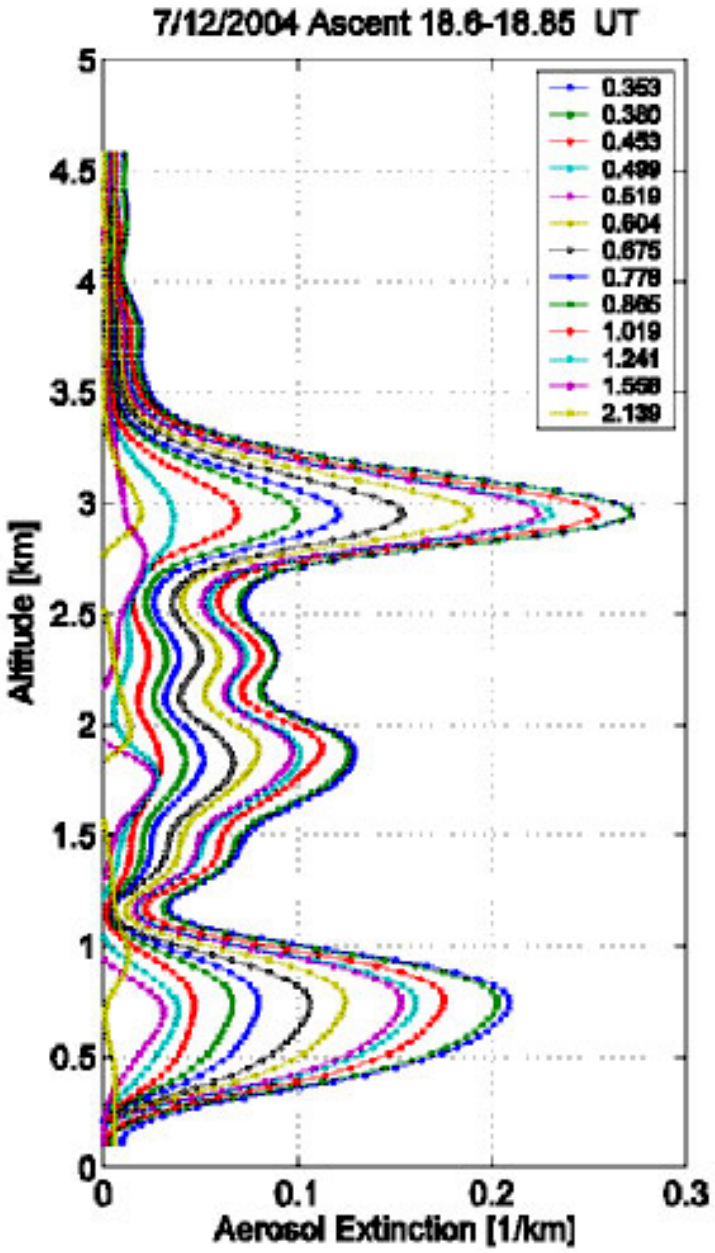
Radar Altimeter: Worked well. Readings agreed with pressure altitude to +-20 ft (6 m).

Issues

J31 fuel burn rate at lowest altitude (200 ft, 60 m) and in spiral ascents was greater than expected. This could impact duration of future flights.


43.5° N
43.0° N
70.5° W
70.0° W
69.5° W
69.0° W
stepped
descent
ascent
Pease
Ron Brown
10
0
10
20
30
40
50 km


NASA Ames Sunphotometer ICARTT
Altitude [km]
Aerosol Optical Depth
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
0.1
0.2
0.3
0.4
0.5


7/12/2004 Ascent 18.6-18.85 UT
Altitude [km]
Aerosol Extinction [1/km]
0.353
0.380
0.453
0.499
0.519
0.604
0.675
0.779
0.865
1.019
1.241
1.558
2.139
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
0.1
0.2
0.3